

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte NAOYUKI KOFUJI,
MASAHITO MORI,
KEN'ETSU YOKOGAWA,
NAOSHI ITABASHI,
KAZUNORI TSUJIMOTO, and
SHIN'ICHI TACHI

Appeal 2007-2849
Application 09/363,191
Technology Center 1700

Decided: November 21, 2007

Before EDWARD C. KIMLIN, CHUNG K. PAK, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

1 This is an appeal from the decision of the Examiner finally rejecting claims 1, 2, 4, 6, 8, 9, and 34-40. An oral hearing was held on November 6, 2007. We have jurisdiction under 35 U.S.C. § 6(b). We AFFIRM.

Claims 1 and 8 are illustrative of the invention and are reproduced below:

1. A dry etching apparatus for treating a body comprising:
 - a chamber;
 - a sample holder in said chamber designated to hold a wafer with a predetermined diameter;
 - means for introducing gas into said chamber;
 - means for exhausting said gas in said chamber;
 - a power supply of Ultra High Frequency;
 - an electromagnetic wave radiation antenna coupled to said power supply and installed in an atmosphere; and

a separation plate used as dielectric between said antenna and the inside of said chamber, wherein

said antenna is a plate antenna including a discoidal electrode to which Ultra High Frequency is applied, an earth electrode and a dielectric plate provided between the discoidal electrode and the earth electrode,

wherein a diameter of said discoidal electrode is not less than that of the wafer.

8. A dry etching apparatus according to claim 1,

wherein said separation plate separates said chamber and a second area where the pressure is higher than the pressure in the chamber,

said antenna is a microstrip antenna formed in said second area;

a coil outside of said chamber; and
wherein the plate antenna resonates TMO1 mode.

The Examiner relies on the following prior art references to show unpatentability:

Fairbairn	US 5,614,055	Mar. 25, 1997
Yokogawa	EP 0 779 644 A2	Jun. 18, 1997
Li	US 6,009,830	Jan. 4, 2000
Nakano	US 6,155,202	Dec. 5, 2000

The Examiner made the following rejections:

1. Claims 1, 2, 4, 6, 8, 9, and 34-38 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

2. Claims 1, 2, 4, 6, 8, and 34-36 under 35 U.S.C. § 103 as unpatentable over Yokogawa.

3. Claims 9, 37, and 38 under 35 U.S.C. § 103 as unpatentable over Yokogawa in view of Nakano.

4. Claims 39 and 40 under 35 U.S.C. § 103 as unpatentable over Yokogawa in view of Li or Fairbairn.

Rejection of claims 1, 2, 4, 6, 8, 9, and 34-38 under 35 U.S.C. § 112, first paragraph

The Examiner contends that the Specification as originally filed fails to provide support for “a dry etching apparatus wherein the antenna includes a discoidal electrode to which Ultra High Frequency is applied, an earth electrode and a dielectric plate provided between the discoidal electrode and the earth electrode.” (Answer 5). Appellants contend that one having ordinary skill in the art would conclude that the basic structure of the claimed antenna is the one described in Figure 2. (Br. 9).

Figure 1 of Appellants' patent application is shown below:

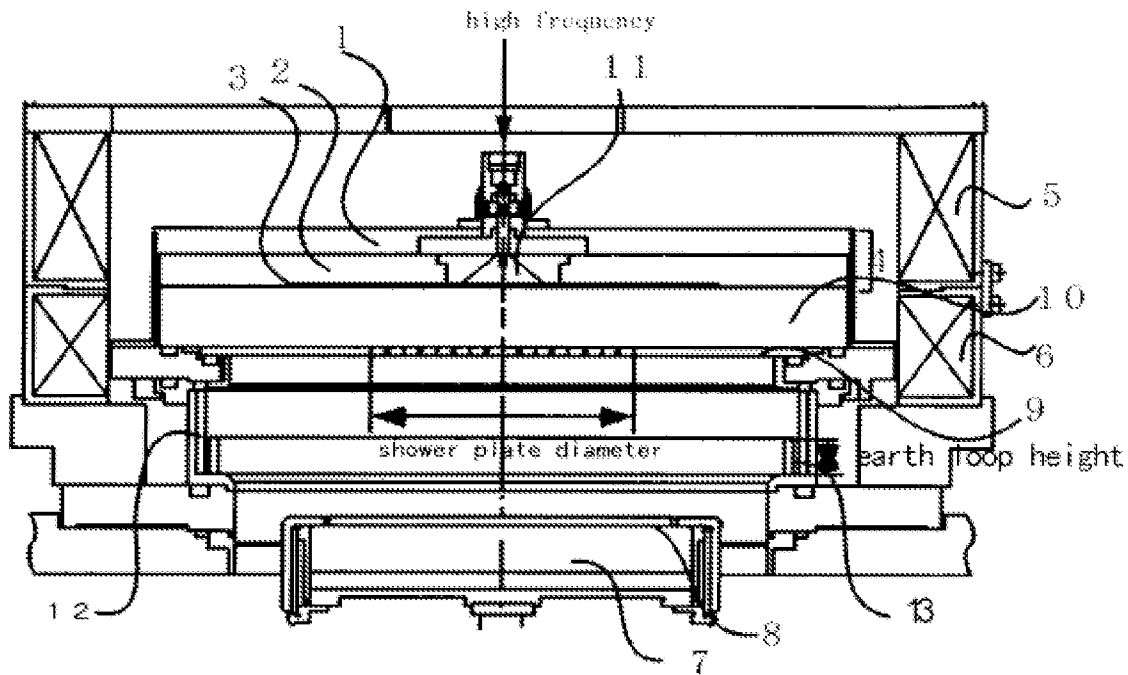


Figure 1 shows an example of the dry etching apparatus of the invention. (Spec. 6). A dielectric 10 separates the inside of the vacuum chamber from the outside. A microstrip antenna (MSA) 4 is positioned in the atmosphere side of dielectric 10. (Spec. 6). The MSA 4 comprises a grounded, discoidal electrode 1, a dielectric 2, and a high frequency discoidal electrode 3. (Spec. 1). A supply of uniform reactive gas is generated from shower plates 9. Plasma of the reactive gas is formed in the vacuum chamber by the electron cyclotron resonance between the electromagnetic wave radiated by the MSA 4 and the magnetic field formed by solenoid coil 5, 6. Sample 8, retained on support 7, is processed by irradiating with the plasma.

Adequate written description means that, in the Specification, the applicant must “convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the [claimed]

invention.” *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991). Appellants describe MSA 4 in detail in reference to Figure 2. (Spec. 1). It is further clear from the Specification that Figure 1 refers to the same MSA 4 and its component parts (i.e., elements 1, 2, and 3) shown and described in connection with Figure 2. 37 C.F.R. § 1.84(p)(4) (“The same part of an invention appearing in more than one view of the drawing must always be designated by the same reference character, and the same reference character must never be used to designate different parts.”).

Accordingly, we are in agreement with Appellants that the Specification as originally filed provides written descriptive support for the invention claimed in claims 1, 2, 4, 6, 8, 9, and 34-38. The rejection is reversed.

Turning now to the prior art rejections, Appellants contend that the Examiner failed to establish a prima facie showing of obviousness for the appealed claims. We have considered Appellants’ arguments. However, we find that the preponderance of the evidence weighs in favor of the Examiner’s conclusion of obviousness for the reasons well-stated in the Answer. We address Appellants’ arguments as to each ground of rejection in greater detail below.

Rejection of claims 1, 2, 4, 6, 8, and 34-36 under 35 U.S.C. § 103 as unpatentable over Yokogawa.

Appellants contend that Yokogawa fails to disclose the claimed relationship between wafer diameter size and discoidal electrode diameter. (Br. 16). In particular, Appellants argue that the diameter of the wafer shown in Yokogawa Figure 1 is greater than the diameter of the discoidal electrode 107. (Br. 15).

Figure 1 of Yokogawa is shown below:

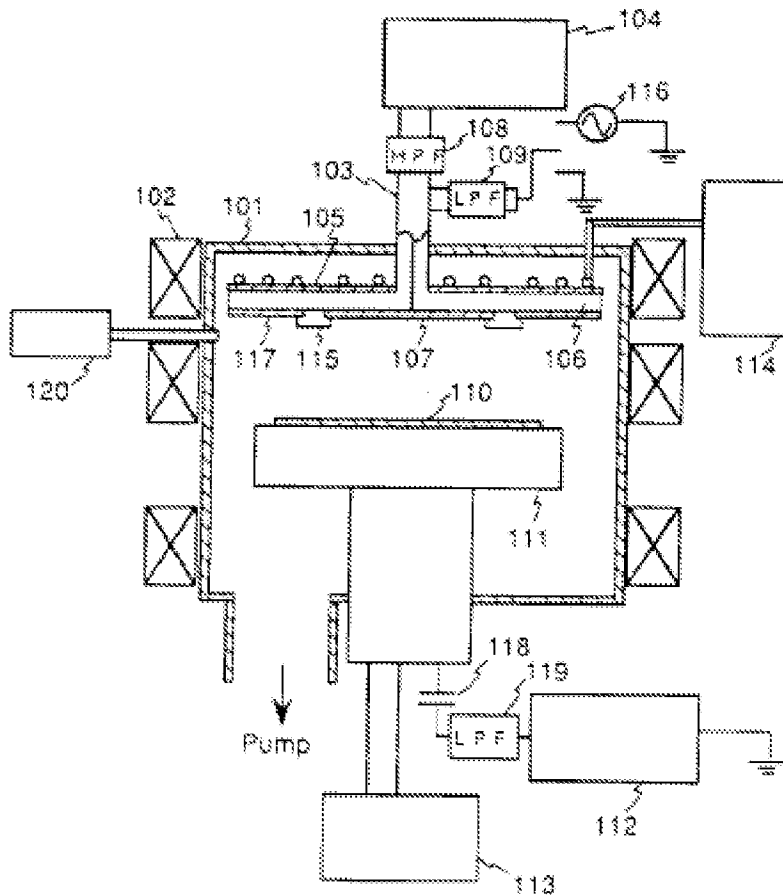


Figure 1 of Yokogawa shows an earth electrode 105, a dielectric 106, and a conductive plate 107. (Col. 5, ll. 30-33). “[C]onductive plate 107 constitutes a microstrip-line resonator by being set on the earth electrode 105 via the dielectric 106.” (Col. 6, ll. 48-50). A source gas is supplied by means 120. Plasma is generated in vacuum chamber 101 by interaction between the electromagnetic wave supplied from power source 104 in an ultra-high frequency band to conductive plate 107 and the magnetic field generated by solenoid coil 102. (Col. 6, ll. 54-58). Sample 110 is retained on sample stand 111. (Col. 6, l. 9).

Apparatus claims cover what a device is, not what a device does. *In re Danly*, 263 F.2d 844, 847 (CCPA 1959). As correctly noted by the Examiner, the wafer is not part of Appellants' claimed invention and, therefore, the limitation relating to wafer size does not patentably distinguish the claimed apparatus from Yokogawa's apparatus. (Answer 11-12). The Examiner properly found that the claimed relationship between wafer diameter size and discoidal electrode diameter is met by Yokogawa, because Yokogawa's apparatus "is capable of processing a wafer having a diameter less than the diameter of the discoidal electrode." (Answer 12). Appellants have not presented persuasive arguments or evidence to refute this finding.

Appellants also contend that Yokogawa fails to disclose an embodiment which includes both a plate antenna and a separation plate which separates the antenna from the inside of the chamber as recited in claim 1. (Br. 17).

In Figure 12, Yokogawa discloses an embodiment in which an electromagnetic wave for generating plasma is supplied to a radial strip-line 606 which is positioned minutely apart from an earth electrode 605. (Col. 16, ll. 28-35). In the Figure 12 embodiment, “space (atmospheric pressure) 615 in which the electromagnetic wave radiator consisting of the earth electrode 605 and others is installed is partitioned from space (vacuum) 616 inside the vacuum vessel 601 by an airtight quartz window 607.” (Col. 16, ll. 45-49). Yokogawa states that an advantage of the Figure 12 embodiment is that “the vacuum vessel 601 can be readily manufactured and maintained” because no vacuum sealing means is required for leading the coaxial cable 603 from outside the vacuum vessel into the vacuum vessel. (Col. 16, ll. 53-58). According to Yokogawa, installation of an electromagnetic wave radiator “in a place which is not vacuum can be also applied to . . . the embodiment shown in Fig. 1.” (Col. 17, ll. 3-8).

Obviousness is not predicated on whether all claim elements are present in a single embodiment. In this case, the Examiner determined that it would have been obvious to have located the antenna of Yokogawa Figure 1 outside the vacuum chamber as shown in Yokogawa Figure 12, since such arrangement will provide an apparatus that is readily manufactured and maintained. (Answer 13). We find that the Examiner’s position is expressly supported by Yokogawa’s disclosure. In particular, Yokogawa clearly suggests that a separation plate, as shown in Figure 12, may be used in the Figure 1 embodiment.

With respect to claim 8, Appellants contend that Yokogawa fails to disclose resonance in the TM01 mode. (Br. 17).

Yokogawa states that “[t]he diameter of the circular conductive plate 107 is set to a diameter in which the resonance mode of an electromagnetic wave can be obtained on this circular conductive plate.” (Col. 5, ll. 33-36). According to Yokogawa, for a TM₁₁ mode, the diameter of the circular conductive plate 107 is approximately 15 cm. (Col. 5, ll. 36-39).

“[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art.” *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980). The Examiner determined that “it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the size of the conductive plate as to obtain the desired claimed resonance mode of electromagnetic waves, as to optimize the apparatus and/or the process performed in the apparatus.” Answer 13 (referencing Yokogawa, col. 5, ll. 33-36). We find the Examiner’s determination that resonance mode is a result effective variable is supported by Yokogawa’s disclosure. Appellants have not presented evidence to refute the Examiner’s position. *See In re Huang*, 100 F.3d 135, 139 (Fed. Cir. 1996) (Even though “[a] modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within the capabilities of one skilled in the art, unless the claimed” invention produces “a new and unexpected result which is different in kind and not merely in degree from the results of the prior art.”).

Rejection of claims 9, 37, and 38 under 35 U.S.C. § 103 as unpatentable over Yokogawa in view of Nakano

Appellants argue that Nakano’s conical-shaped electrode is used in an apparatus placed in a vacuum unlike the claimed conical-shaped feed division which is placed on the discoidal electrode. (Br. 18).

“[W]hen a patent ‘simply arranges old elements with each performing the same function it had been known to perform’ and yields no more than one would expect from such an arrangement, the combination is obvious.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740 (2007) (quoting *Sakraid v. Ag Pro, Inc.*, 425 U.S. 273, 282 (1976)). The Examiner determined that it would have been obvious to have provided Yokogawa’s power supply in the form of a cone because it provides better power consumption efficiency and optimization of the film being formed results. (Answer 8). In our view, the Examiner’s determination is reasonable. *In re Beattie*, 974 F.2d 1309, 1312 (Fed. Cir. 1992) (“As long as some motivation or suggestion to combine the references is provided by the prior art taken as a whole, the law does not require that the references be combined for the reasons contemplated by the inventor.”). Appellants’ argument is not persuasive because it does not address the facts and reasons relied on by the Examiner.

Rejection of claims 39 and 40 under 35 U.S.C. § 103 as unpatentable over Yokogawa in view of Li or Fairbairn

Appellants contend that the Examiner has not established a prima facie showing of obviousness because the claim limitations address a specific problem in the prior art apparatuses which is not appreciated by either Li or Fairbairn. (Br. 20).

A prima facie case of obviousness is established where the Examiner demonstrates that the invention is nothing more than the predictable result of a combination of familiar elements according to known methods *KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. at 1739. The Examiner found that both Li

and Fairbairn disclose an apparatus in which a gas shower plate is used as the gas introducing means and wherein the shower plate is smaller in diameter than the wafer being processed. The Examiner concluded that it would have been obvious at the time of the invention to modify the apparatus of Yokogawa to comprise a shower plate as taught by Li or Fairbairn because this provides more uniform distribution of gas in the apparatus such that it is more efficiently and effectively directed and concentrated toward the wafer being processed. (Answer 9). In our view, the facts and reasons relied on by the Examiner are sufficient to establish a prima facie showing of obviousness as to claims 39 and 40. Once again, Appellants' argument is not persuasive because it does not address the Examiner's findings and conclusions.

ORDER

The decision of the Examiner rejecting claims 1, 2, 4, 6, 8, 9, and 34-38 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement is reversed.

The decision of the Examiner rejecting claims 1, 2, 4, 6, 8, and 34-36 under 35 U.S.C. § 103 as unpatentable over Yokogawa is affirmed.

The decision of the Examiner rejecting claims 9, 37, and 38 under 35 U.S.C. § 103 as unpatentable over Yokogawa in view of Nakano is affirmed.

The decision of the Examiner rejecting claims 39 and 40 under 35 U.S.C. § 103 as unpatentable over Yokogawa in view of Li or Fairbairn is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(i)(iv).

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AFFIRMED

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